

THE 3.1  $\mu\text{m}$  INFRARED SPECTRA OF VIBRATIONALLY EXCITED  $\text{C}_3$  IN A SUPERSONIC PLASMA JET

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The linear triatomic carbon ( $\text{C}_3$ ), one of the most important molecules that have been identified in both dense and diffuse interstellar environments, has attracted great interest to astronomers and astrochemists. It is also of fundamental interest as it serves as a benchmark system for quantum chemistry. In this presentation, we report the high-resolution infrared spectra of  $\text{C}_3$  in the 3.1  $\mu\text{m}$  region. The  $\text{C}_3$  molecules are produced in a supersonic pulsed planar plasma by discharging a propyne/helium/argon gas mixture. Continuous-wave cavity ringdown spectroscopy is used to record the infrared absorption spectra of  $\text{C}_3$ . In total, eighteen vibrational bands are observed in the 3110 - 3290  $\text{cm}^{-1}$  range, and sixteen of them are reported for the first time. It is found that, the vibrational temperatures for the two CC stretch modes of  $\text{C}_3$  are up to 8000 K in our plasma source, allowing to experimentally determine the ro-vibrational levels of  $\text{C}_3$  to the 10 000  $\text{cm}^{-1}$  region. Accurate spectroscopic parameters are obtained from the detailed analysis of our spectra. The molecular data reported here are used to test the very recent theoretical work beyond the 'gold standard' <sup>a</sup> for a comprehensive understanding of the ground-state potential energy surface of  $\text{C}_3$ .

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<sup>a</sup>P. Botschiwina, private communication.